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empty flowering glume. In *Melica* several such become strangely modified.

The palet is frequently reduced to a rudiment, as in some species of *Agrostis*, or it may be entirely absent, as in other species of the same genus.

The lodicules, two in most grasses, are three in number in many *Bambuseæ* and altogether wanting in *Alopecurus* and *Anthoxanthum*.

As to the morphology of these organs, it is now generally agreed that the empty glumes and flowering glumes are bracts on the main axis, while the palet is a bractlet on a lateral branch. The lodicules have been supposed to be the vestiges of a perianth.

The empty glumes are variously named by authors. Linnaeus and Adanson called them the *calyx*; Jussieu, Kunth and others the *glumæ*; Agardh the *glumæ exteriæ*; Link the *glumæ valvæ* or *perigonum externum*; Scheuchzer the *glumæ steriles*; Trinius the *glumæ calycinæ*; Blumenbach the *glumæ vacuæ*; Schleiden the *valvæ glumæ*; Watson the *lower glumes*. With Beauvois they constitute the *tegmen*; with Richard the *lepicena*; with Nash the *empty scales*; with Panzer the *peristachyum*; with Reichenbach the *bractæ*.

The two empty glumes have been commonly distinguished by the adjectives lower and upper, outer and inner, first and second, or their Latin equivalents. Watson, however, in the 1890 edition of Gray's 'Manual' calls the upper the middle glume when the spikelets are but one-flowered.

The flowering glume and the palet together constitute with Linnaeus the *corolla*, or the *valvulae corolla*; with Trinius the *valvulae* or *glumæ corolla*; with Jussieu the *calyx*; with Reichenbach the *calyx exterior*; with Beauvois the *stragula*; with Richard and with Link the *glumellæ*; with Malpighi, Schleiden, Lindley and others the *paleæ*; with Agardh the *glumæ intérie*; with Scheuchzer the *folliculi*; with Robert Brown the *perianthium*; with Link the *perigonium internum*. These likewise have been distinguished by the adjectives inferior and superior, exterior and interior, or their equivalents.

With the use of the word flowering glume,

the word palea or palet has by almost universal usage been confined to the organ opposite the flowering glume. However, Döll quotes the term *spathella*, said to be used by Turpin.

The lodicules have also come in for their liberal share of names. They are, with Malpighi the *loculi*; with Adanson and most later authors the *lodiculæ*; with Linnaeus the *nectaria*; with Jussieu the *squamæ*; with Richard *glumellæ* in common with the flowering glume and the palea; with Agardh the *glumæ intimæ*; with Reichenbach the *calyx interior*; with Schleiden the *squamulæ*; with Link the *periphylla*, *paropetala* or *perigynium*; with Turpin the *phycostemon*; with Gray in earlier writings the *hypogynous scales*; with Desvaux the *glumellulæ*; with Nees the *peri-anthium*.

It would seem that with this large mass of terms and multiplied resulting combinations of terms, there is little excuse for introducing a new one. And yet in all this flood of names no one seems to have realized the convenience of having a simple and distinctive name for the organ most used for systematic purposes, the flowering glume. It has been called a valve of the calyx or corolla as the author conceived, or associated with the glumes below it or the palet above it, but never has it received an exclusive designation.

This it seems to the writer is demanded not only by the taxonomic importance of the organ, but as matter of great convenience, incidentally limiting the terms *glumes* strictly to the empty glumes, and obviating any confusion with the palet. In a recent publication I have, therefore, introduced the word *lemma* (Greek *λεῖα*, a husk or scale) for the 'flowering glume.' For the 'empty glume' the simple word *glume* is adopted. Palet and lodicule are used as heretofore. The so-called third glume of the *Paniceæ* is a *sterile lemma*, as perhaps are the supernumerary 'empty glumes' in *Uniola* and the *Bambuseæ*.

C. V. PIPER.

DEPARTMENT OF AGRICULTURE.

NOTE ON THE MOLECULAR FORCES IN GELATINE.

SOME time since, while engaged in a research on fluorescence it became necessary to

know the index of refraction of solid gelatine. As I failed to find the value in any book of constants to which I had access I proceeded to make the determination. I took a 90° totally reflecting prism of flint glass and on the long face dropped a few drops of the purest gelatine I could buy—dissolved in warm water. The liquid gelatine spread out and formed two disks of the gelatine about the size and thickness of silver dimes. I then laid the prism away for the gelatine to dry and harden, expecting to determine its index by determining the critical angle of glass-gelatine. But when I examined the prism a few days later I found it ruined. The gelatine had dried out and contracted, and had clung to the glass with such tenacity that some of the glass had been torn from the remainder of the glass—all the way around the circumference of the gelatine disks, forming an annular cavity from .01 cm. to .1 cm. deep.

This experiment proves, in this instance at least, that the cohesive and contractile forces of gelatine, and the adhesion of gelatine for flint glass are greater than the cohesion of the glass. It proves more, for consider the relatively enormous force that must be exerted to pull a piece, say a disk of glass, from (out of) a large plane-faced block of glass where one must take into account the forces about the edge of the disk as well as those on its faces.

I have lately repeated the experiment, using pieces of window glass instead of the prism. Several times the gelatine disks on drying sprung loose from the glass without injuring the surface. However, on taking extra precautions to have the glass surfaces clean, the gelatine prepared in a clean vessel, and very little water used in dissolving it, patches of glass were pulled off by the gelatine drying and springing up around the edge of the disk.

An unsuccessful attempt was made to measure the tenacity of solid gelatine, unsuccessful because of the difficulty in getting a sample free from internal strain. Further experiments are in progress.

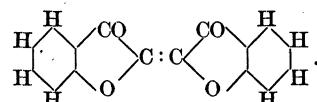
ARTHUR L. FOLEY.

PHYSICS LABORATORY,
INDIANA UNIVERSITY,
April, 1906.

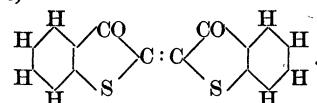
NOTES ON ORGANIC CHEMISTRY.

NEW ANALOGUES OF INDIGO.

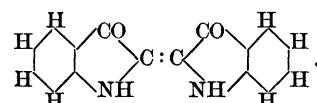
THE importance of indigo in the arts is so great that considerable general interest attends the discovery of related compounds. Some years ago P. Friedländer and J. Neudörfer¹ prepared a compound which they believed to be represented by the formula,



Friedländer has now confirmed this result² and has also obtained the corresponding thio-derivative,



On comparing these formulæ with that of indigo,



it will be observed that the two new compounds are to be regarded as indigo in which the bivalent imino (NH) group is replaced by an equivalent atom of oxygen and sulphur, respectively.

Oxygen-indigo, as the first compound may be termed, is a red dye which is much more rapidly acted on by light than indigo. Its preparation is attended with considerable difficulty.

Thioindigo, on the other hand, can be obtained with comparative ease from thiosalicylic acid. It also is a red, sparingly soluble dye, crystallizing in brown-red needles with a bronze luster. Its chloroform solution is red, with a shade of blue, and it exhibits a strong yellowish-red fluorescence and a characteristic absorption spectrum. At high temperatures thioindigo is more stable than indigo and may be sublimed and distilled. Thioindigo resembles indigo in its behavior with acids, re-

¹ *Ber. d. Chem. Ges.*, **32**, 1867 (1899).

² *Ibid.*, **39**, 1060 (1906).